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ZOOLOGY.

PHOSPHORESCENCE OF MARINE ANIMALS.—The address in Section D, biology, of the British Association, was delivered by Professor W. C. McIntosh, M.D., of St. Andrews, who selected for his subject, the "Phosphorescence of marine animals." A phenomenon so striking as the emission of light by marine organisms could not fail to have attracted notice from very early times, both in the case of navigators and those who gave their attention in a more systematic manner to the study of nature. Accordingly, we find that the literature of the subject is both varied and extensive—so much so, indeed, that it is impossible on the present occasion to give more than a very brief outline of its leading features. Though it is in the warmer seas of the globe that phosphorescence is observed in its most remarkable forms—as, for instance, the sheets of white light caused by Noctiluca and the vividly luminous bars of Pyrosoma—yet it is a feature which the British zoölogist need not leave his native waters to see both in beauty and perfection. Many luminous animals occur between tide-marks, and even the stunted seaweeds near the line of high-water everywhere sparkle with a multitude of brilliant points. As a ship or boat passes through the calm surface of the sea in summer and autumn, the wavelets gleam with phosphorescent points, or are crested with phosphorescent points, or are crested with light; while the observer, leaning over the stern, can watch the long trail of luminous water behind the ship from the brightly sparkling and seething mass at the screw to the faint glow in the distance. On the southern and western shores, again, every stroke of the oar causes a luminous eddy, and some of the smaller forms are lifted by the blade and scintillate brightly as they roll into the water. The dredge and trawl likewise produce, both in the shallower and deeper parts of our seas, many luminous types of great interest and beauty. He glanced, in the first instance, at the various groups of marine animals which possess the property of phosphorescence, and continued: It is found that this feature is possessed by certain members of the Protozoa, and by the following groups of the Metazoa, viz., cœlenterates, echinoderms, worms, rotifers, crustaceans, molluscoids, mollusks and fishes. In foreign seas many brightly luminous specimens are met with. Thus Professor A. Agassiz describes *Mnemiopsis leidyi* as "exceedingly phosphorescent, and when passing through shoals of these Medusæ, varying in size from a pin's head to several inches in length, the whole water becomes so brilliantly luminous that an oar dipped in the water up to the handle can plainly be seen on dark nights by the light so produced; the seat of the phosphorence is confined to the locomotive rows; and so exceedingly sensitive are they that the slightest shock is sufficient to make them plainly visible by the light emitted from the eight phosphorescent ambulacra." The same author mentions that Lesueuria has a very peculiar bluish light of an exceedingly pale steel color, but very intense. Giglioli, again, found that the beautiful riband-like Cestus shone with a reddish-yellow light, but in Eucharis the latter was intensely blue. In the Chætopteridæ the phosphorescence is remarkably beautiful, bright flashes being emitted from the posterior feet. Marine phosphorescence has some of its most striking examples among the Tunicates. One of the best known instances is that of Pyrosoma, the light from which has been so graphically described by M. Péron, Professor Huxley, and other naturalists who have had an opportunity of observing it. It proceeds in each member of the compound organism from two small patches of cells at the base of each inhalent tube. Phosphorescence in living fishes appears to have been accurately observed within a comparatively recent date, though the luminosity of dead fishes has been known from very early times, and has been the subject of many interesting experiments, such as those of Robert Boyle on dead whitings, and Dr. Hulme on herrings. I do not mean to say that the literature of the so-called phosphorescent fishes is scanty, for it extends from the days of Aristotle and Pliny to modern times, but that the writers have had little reliable evidence in regard to living fishes to bring forward. Thus, of upwards of fifty fishes entered by Ehrenberg in his list it is hard to say that one is really luminous during life. In many cases it is probable that the supposed phosphorescence of large forms, such as swordfishes and sharks, has arisen from the presence of multitudes of minute phosphorescent animals in the water, just as the herring causes a gleam when it darts from the side of a ship. Professor Moseley, for instance, observed in the *Challenger* that when large fishes, porpoises, and penguins dashed through phosphorescent water it was brilliantly lit up, and their track marked by a trail of light. The same feature is observed in hooked fishes, and it is known that fishermen are doubtful of success when the sea is very phosphorescent, for the presence of the net in the water excites the luminosity and scares the herring. One of the most striking instances of phosphorescence in living fishes is that of the luminous shark (*Squalus fulgens*), found by Dr. Bennett. This is a small, dark-colored shark, which was captured on two or three occasions at the surface of the sea. It emitted without irritation a vivid greenish luminosity as it swam about at night, and it shone for some hours after death. The phosphorescence appears to be due to a peculiar secretion of the skin. The eyes of the shark were more prominent than usual in such forms. A survey of the life-histories of the several phosphorescent groups affords at present no reliable data for the foundation of a theory as to the functions of luminosity, especially in relation to food. No phosphorescent form is more generally devoured by fishes or other animals than that which is not; and, on the other hand, the possessor of luminosity, if otherwise palatable, does not seem to escape capture. An examination of the stomachs of fishes makes this clear, except, perhaps, in the case of the herring, which, however, is chiefly a surface fish. Further, it is not evident that such animals are luminous at all times, for it is only under stimulation that many exhibit the phenomenon.

THE FAUNA OF THE ARALO-CASPIAN BASIN.—There is ample evidence that the waters here had formerly a much wider extension, but the exact time, or times, when this occurred—although geologically recent—has yet to be determined. Dr. S. P. Woodward, in his Manual of the Mollusca, says the Aralo-caspian limestone indicates the former presence of a great inland sea—larger than the Mediterranean—at a time previous to that of the Mammoth and the Siberian rhinoceros. This steppe-limestone rises to a level of 200 or 300 feet above the present level of the Caspian.

The fact of the waters of the Caspian and Aral being only brackish, and by no means very salt, leads me to think that the basin has not been a close one for a *very* long period. General von Helmersen found well-preserved specimens of two kinds of shells, viz., *Cardium edule* and *Dreissena polymorpha*, in the sands of the desert of Harakum. Both these species still live in the Caspian. And Helmersen expresses his belief that the entire country from the Aral on to the sandy deserts of Akkum is an old sea-bottom (Quart. Journ. Geol. Soc., 1869, Vol. xxv, Memoirs, p. 8).

The present surface of the Caspian is eighty-four feet below that of the Black sea, and according to Major Wood, a rise of 220 feet would cause the waters of the Caspian to overflow the watershed of the Tobolsk, a tributary of the Obi.

According to the same authority, a rise of twenty-three feet in the waters of the Black sea would cause it to overflow into the Caspian by the line of the Manytseh.

From these figures it appears that if the level of the Caspian were to rise (84 × 23) 107 feet, its waters would find their way westward into the Black sea, and if the outlet in that direction were blocked so as to permit the surface of the Caspian to rise 220 feet, the waters would escape northward into the Tobolsk and down the valley of the Obi into the Arctic ocean. Now the Caspian at present contains seals, fishes, Crustacea and Mollusca, some of which are either identical with, or very closely resemble those of the Arctic sea. The seal which inhabits its waters (*Phoca caspica*) is so like the common *P. vitulina* that some naturalists consider it to be a mere variety of that species. There are also the beluga, the sturgeon, the herring, the sterlet, and the salmon, some of which are species that go up rivers from the sea. Among the Crustacea is *Idothea entomon*, found in the Kara sea, near the mouth of the Obi, and *Mysis relicta*, another northern species. So that there *are* grounds for supposing that some communication may have formerly existed by way of the Obi with the Arctic ocean. No doubt the waters of the Aralo-caspian basin have undergone many changes of level. Some of the mollusca which still live there, such as the Cardium and Dreissena, appear to be descendants of species found in the Congerian beds of that region, which go back to Miocene times.—*T. F. Jamieson in the Geological Magaziue, May, 1885.*

AMŒBA INFESTING SHEEP.—Sheep in New South Wales are affected by a disease which appears to be very similar to epithelial cancer, and is met with on the feet behind the hoofs, and also on the lips and nostrils and the gums of lambs. The epithelium in these places grows with pathological rapidity, the horny layer produced soon attains a thickness of 3–5^{mm}, the wool drops out in the diseased parts, and below the thick outer layer a festering process sets in. After some time a new epithelium makes its appearance below the festering layer. Then, provided the lamb does not die, the thick horny layer is thrown off like scurf, and the epithelium below attains new wool, and replaces the old skin.

In studying the circumstances in which these sheep live, Dr. R. v. Lendenfeld found that they were invariably exposed to being wounded in those places, which eventually developed the disease, blistered by standing on rocks heated by the sun after they had been standing in water for several hours, or pricked by the spines of the variegated thistle, and it was found by a process of artificial breeding in an aquarium that the disease is produced by an Amœba (*A. parasitica.* n. sp.), which enters the wounds and multiplies rapidly in the epithelium, causing very strong irritation. The organism is found between the layers of horny substance. It does not differ morphologically from the well-known *A. princeps* of Ehrenberg.

Dr. Lendenfeld adds, "It is well known that several fungi in certain stages of their life appear very similar to Amœbæ, and so it is not impossible that my Amœba is in some connection with them. I do not consider this probable, however, as I made no observation which might lead one to suppose that the Amœba ever divided into a multitude of swarming spores."—*Journ. Roy. Micr. Soc., December, 1885.*

DESICCATION OF ROTIFERS.—Mr. H. Davis, at a recent meeting of the Quekett Microscopical Club, exhibited some strips of note-paper on which were several groups of dried Philodines (*P. roseola*), looking like clear red spots. These had been sent to Mr. Davis by the Rev. E. T. Holloway, of Clehanger, who had thus succeeded in obtaining specimens of these dried rotifers quite free from sand or dirt of any kind, which has been considered by some to be the only protective.

Dr. C. T. Hudson writes us that "nothing could be more instructive than these curious clusters. In the great majority of cases, each rotifer was seen imbedded in a patch of glutinous secretion, which was divided from the similar patches of the surrounding rotifers by sharp straight lines, so as to give the whole group the appearance of a tesselated pavement. Here and there the Philodines were glued together by long tongues of the same secretion; especially were the fibers of the paper projected above the general surface, and, by spoiling the level, presented the formation of a sharp bounding line. In one case, a rotifer had bored its way into the fibers of the paper, and, unable to withdraw or contract itself, had formed the center of a whole group of others attached to it by radiating bands of glue. In fact, these beautifully clean groups gave ocular demonstration of the truth of Mr. Davis' theory that the Philodines resist drought by encasing themselves in a glutinous case of their own secreting, and the efficiency of the protective was at once shown by putting the strips in water, when the buried rotifers soon struggled into life." —*Journ. Roy. Micr. Soc., February, 1886.*

Parasite of the Rock Oyster.—Mr. W. A. Haskell, on examining some samples of oysters which were dying in large numbers, found that most of them, when opened, presented on the inner surface of the shell one or more discolored blisters. In some these were of small extent with a narrow sinuous form, while in many instances a large part of the valve was affected. In some cases, where the extent of the shell invaded was not large, the oysters did not seem at all affected by it; in other cases the animal was found to be dead, and in a few cases the shell was completely empty. In the interior of the blisters were found one or more specimens of a very small annelid, by which the mischief had been effected—*Polydora ciliata.* One specimen of a second species was also obtained, *P. polybranchia*, n. sp., which the author describes.—*Jour. Roy. Micr. Soc., December, 1885.*

Sense-organs of Copepod Crustacea.—Dr. O. E. Imhof has some notes upon the antennary olfactory organs of the genera Heterocope and Diaptomus.

These appear to have been discovered in Heterocope by Gruber; in Diaptomus they exist in all the species examined, and have a characteristic distribution, which is the same in all the species, and may, perhaps, serve as an additional definition of the genus. The form of the organs in Diaptomus is a little less complicated than in Heterocope; they resemble very closely the corresponding organs of Pontella described by Claus.—*Journ. Roy. Micr. Soc., December, 1885.*

Birds breeding in Ants' Nests.—The Southern chestnut woodpecker (*Micropternus gularis*), always, as far as I have observed, uses an ants' nest to nest in, and Mr. Gammie, the superintendent of the Government cinchona estates at Mongphoo, near Darjeeling, has noticed the same thing with regard to the allied Northern species, *Micropternus phaloceps*, and the peculiarity probably extends also to the allied species found in Burmah, Siam, &c.

Mr. Gammie thinks that when an ant's nest has been taken possession of by the bird that the ants desert the nest. This is a point on which I cannot speak with certainty. Mr. Gammie has taken nests of the Northern species in which, although the bird had laid, the ants remained, and he has taken other nests where not a single ant remained, but there is nothing to show that these nests were not deserted before the bird took possession. I, myself, have taken nests of the Southern form, in which, though the eggs were partially incubated, the ants remained, showing that some considerable time must have elapsed since the bird took possession. This is a point that I hope to be able to elucidate within the next few months, when the birds will be breeding.

When Micropternus is breeding, the feathers of the head, tail and primaries of the wings are yet covered with a viscid matter, having a strong resinous smell, and this substance is usually rather thickly studded with dead ants (*vide* "Stray Feathers," Vol. VI, p. 145).

Two specimens of kingfishers also to my knowledge nidificate in ants' nests, viz., *Halycon occipitalis*, confined to the Nicobar islands, and *H. chloris*, which ranges from India as far south as Sumatra.

At Mergni, in South Tenasserim, I found a nest of *H. chloris* in a hornet's nest, and although I saw the birds repeatedly enter the hole they had made in the hornet's nest, the hornets did not seem to mind it; but they resented in a very decided manner any attempt to interfere with the nest.—*Wm. Davison*, *Nature*, *March 12, 1885.*

THE SOARING OF BIRDS.—Mr. Hendricks, in the NATURALIST for March, intimates that I misinterpret the phenomenon of soaring, "for it is well known that the upward lateral force would arrest the downward motion, so that the *cause* of the upward motion would be immediately withdrawn."

It would seem that the "downward motion" could only be arrested by resisting the lateral force. On his own showing the gravity of the *body* cannot do it, as this "is descending uniformly through the atmosphere and is therefore meeting with atmospheric resistance equal to its weight" There is no air condensed nor driven out of the way in the lateral motion, so that the only resistance to the lateral force is that of atmospheric friction on the smooth surfaces of the plane, and this is very little.

To enable the weight to resist the lateral force it would have to be created, as the original amount is fully occupied.

As action and reaction are equal and opposite, and normal to the falling surface, the inclination in which that surface lies is a *neutral plane*, and no amount of force acting in that plane can increase or diminish its downward motion.

It is obvious that an incident force at any angle whatever from any direction above the plane would increase the fall, and at any angle or direction from below would diminish it, while in the plane, from any direction, its motion would neither be increased nor diminished but remain unchanged.

There would simply be a motion added to the body, in its own plane, in the direction of the impressed force and proportional to it.

I can detect no "error" arising from "a misconception of the phenomena of resulting motion." The body falls with uniform speed, constituting one of the factors of soaring. It is then moved laterally on an upward incline, which is the other factor. These *result* in the level motion of flight in obedience to the law of all resultant motions.

It seems like a covert attempt on the part of Mr. Hendricks to lodge a perpetual motion scheme with the soaring problem. I am confident that no such fallacy can be domiciled within its precincts.—*I. Lancaster, 335 Wabash avenue, Chicago.*

ZOOLOGICAL NEWS.—*General.*—The deep-water fauna of Lake Leman, if the line between it and the littoral fauna be drawn at thirty metres, at which depth chlorophyll-forming vegetation ceases, consists of about 100 species: Fishes, 14; insects, 3; Arachnida, 19; Crustacea, 16; Hydroidea, 1; Rhizopoda, 13; Cilioflagellata, 1; Gasteropoda, 4; Lamellibranchiata, 2; Annelida, 4; Nematoidea, 3; Cestoidea, 1; Turbellaria, 18; Bryozoa, 1; Rotifera, 2. Most of these are evidently the descendants of the inhabitants of the shallow waters, and differ chiefly in their smaller size and duller tint; but M. Forel maintains that *Niphargus puteanus*, var. *forelii*, and *Asellus forelii* are descended from *Niphargus puteanus* and *A. cavaticus* of the wells of Europe, the resemblance being too close to have been arrived at independently.——The Limneas and Chironomus larvæ which inhabit the deep waters of Lake Leman, breathe water instead of air, *i. e.*, the tracheæ of the one and the pulmonary sacs of the other are filled with water. Larvæ of the dipterous insects abound, but pupæ are rare or absent, and perfect insects are never seen to rise from the surface of the deeper parts of the lake; moreover, larvæ of all sizes and ages are found at the bottom at the same season. This makes it probable that these larvæ never attain the perfect stage, but are capable of reproduction by pædogenesis.

Mammalia.—Carnivora are still common in the north of Europe. The "Statistical Year Book" for Finland states that in 1882 not less than 85 bears, 128 wolves, 407 lynxes, 4005 foxes, 76 gluttons, 240 otters, 143 martens, 1583 ermines and 3947 carnivorous birds were killed and paid for by the Government. The losses during the same year from Carnivora were estimated at 274 horses, 846 cattle, 5246 sheep, 168 pigs, 119 goats, 1681 reindeers and 2366 chickens.

Crustacea.—The Crustacea of the Norwegian North Atlantic Expeditions, excluding forms previously established as belonging to the Norwegian littoral fauna, have been described by G. O. Sars. They comprise: Brachyura, 1 sp.; Anomoura, 1; Caridea, 4; Mysidæ, 5; Cumaceæ, 1; Isopoda, 18; Amphipoda, 45; a copepod, *Eucheta norvegica*, always found at considerable depths, six cirripeds and *Stylon hymenodore*, a rhizocephalon attached parasitically to the abdomen of *Hymenadora glacialis*, and dredged in 1861 fathoms.——*Bythocaris leucopis* and *payeri*, true deep-sea carideans of the North Atlantic (1110 fathoms), do not pass through the usual larval stages, but on quitting, the remarkably large embryos have the full number of appendages found in the parent. *Hymenodora glacialis* has an exopodite attached to the outer side of the second joint of the legs, as in the schizopods.——*Boreomysis scyphops*, a schizopod taken by the Norwegian North Atlantic expedition has very singular eyes. The outer surface of these organs is concave, they are attached close together, and are destitute of any specific ocular pigment.——*Sphyrapus serratus* Sars, is a singular sightless isopod which occurs in the open sea between Norway and Iceland, at depths of from 1163 to 1333 fathoms. It has nineteen paired appendages. The first pair of legs springing from the posterior part of the cephalic segment, are powerful prehensile organs. The second pair of legs are as long as the body, flattened, and armed with powerful spines. Five pairs of slender walking feet follow, and are followed by five of biramous swimming feet and a pair of long branched and many-jointed caudal appendages.

EMBRYOLOGY.[1]

ON AN UNUSUAL RELATION OF THE NOTOCHORD TO THE INTESTINE IN THE CHICK.—Through the great kindness of Dr. G. Baur, of the Peabody Museum, New Haven, Conn., I am enabled to figure an apparently rare mode of development of the notochord in the embryo chick. In order to enable the reader to more readily understand the peculiar morphological relations to each other of the posterior ends of the nervous cord, chorda and intestine in the series of sections prepared by Dr. Baur, I have endeavored to combine in one figure what seemed to me to be a correct interpretation of the relations of the parts involved.

The series of sections loaned me and from which I am kindly permitted to figure such portions as are of interest in this connection, were prepared from an embryo of the seventh day. The

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[1] Edited by JOHN A. RYDER, Smithsonian Institution, Washington, D. C.